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TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

TC7WBD125AFK

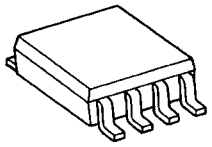
Dual Bus Switch with Level Shift

The TC7WBD125AFK is a low on-resistance, high-speed CMOS 2-bit bus switch. This bus switch allows the connections or disconnections to be made with minimal propagation delay while maintaining Low power dissipation which is the feature of CMOS.

When output enable ($\overline{OE}$) is at low level, the switch is on; when at high level, the switch is off.

The device is enable to realize the shift of signal level from 5 V to 3.3 V.

All inputs are equipped with protector circuits to protect the device from static discharge.



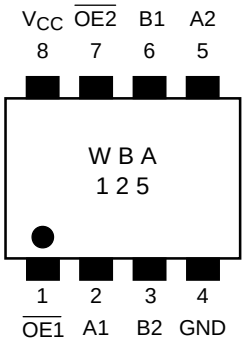
SSOP8-P-0.50A

Weight: 0.01 g (typ.)

Features

- Operating voltage: V_{CC} = 4.5~5.5 V
- High speed operation: t_{pd} = 0.32 ns (max)
- Ultra-low on resistance: R_{ON} = 5 Ω (typ.)
- Electro-static discharge (ESD) performance: ±200 V or more (JEITA)
  ±2000 V or more (MIL)
- TTL level input (control input)
- Low Power Dissipation: Icc = 10 μA (max.)
- Package: US8

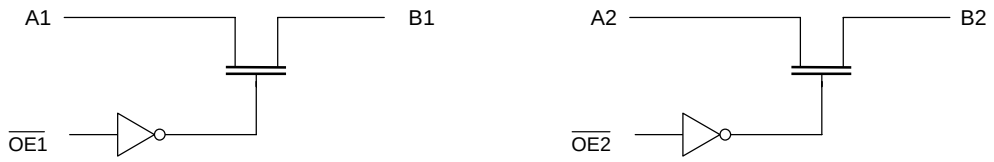
Pin Assignment (top view)



Truth Table

Inputs $\overline{OE}$	Function
L	A port = B port
H	Disconnect

System Diagram



Maximum Ratings

Characteristics	Symbol	Rating	Unit
Power supply voltage	V_{CC}	−0.5~7.0	V
Control pin input voltage	V_{IN}	−0.5~7.0	V
Switch terminal I/O voltage	V_S	−0.5~7.0	V
Clump diode current	I_{IK}	−50	mA
Switch I/O current	I_S	128	mA
Power dissipation	P_D	200	mW
DC V_{CC}/GND current	I_{CC}/I_{GND}	±100	mA
Storage temperature	T_{stg}	−65~150	°C

Recommended Operating Conditions

Characteristics	Symbol	Rating	Unit
Power supply voltage	V_{CC}	4.5~5.5	V
Control pin input voltage	V_{IN}	0~5.5	V
Switch I/O voltage	V_S	0~5.5	V
Operating temperature	T_{opr}	−40~85	°C
Control pin input rise/fall time	dt/dv	0~10	ns/V

Electrical Characteristics

DC Characteristics (Ta = –40~85°C)

Characteristics		Symbol	Test Condition		V_{CC} (V)	Min	Typ. (Note 1)	Max	Unit
Input voltage	"H" level	V_{IH}	—		4.5~5.5	2.0	—	—	V
	"L" level	V_{IL}	—		4.5~5.5	—	—	0.8	
High-level output voltage (Note 2)		V_{OH}	IOH=-1μA V_{IS} = V_{CC}		4.75	2.3	2.8	3.2	V
					5.0	2.5	3.0	3.4	
					5.25	2.7	3.2	3.6	
Input leakage current		I_{IN}	V_{IN} = 0~5.5 V		4.5~5.5	—	—	±1.0	μA
Power off leakage current		I_{OFF}	A, B, $\overline{OE}$ = 0~5.5 V		0	—	—	±1.0	μA
Off-STATE leakage current (switch off)		I_{SZ}	A, B = 0~5.5 V, $\overline{OE}$ = V_{CC}		4.5~5.5	—	—	±1.0	μA
ON resistance (Note 3)		R_{ON}	V_{IS} = 0 V	I_{IS} = 64 mA	4.5	—	5	9	Ω
					4.75	—	5	8	
				I_{IS} = 30 mA	4.5	—	5	9	
					4.75	—	5	8	
			V_{IS} = 2.3 V, I_{IS} = 15 mA		4.5	—	35	65	
					4.75	—	35	50	
Quiescent supply current		ICC	VIN = VCC or GND, I_{OUT} = 0		5.5	—	—	10	μA
Increase in I_{CC} per input		ΔI_{CC}	V_{IN} = 3.4 V (one input)		5.5	—	—	2.5	mA

Note 1: Typical values are at V_{CC} = 5 V, Ta = 25°C.

Note 2: It recommends that this device uses Pull-up resistance when adding and using resistance for an output terminal. Since it couses to drop a VOH voltage level when using Pull-down resistance for an output terminal.

Note 3: Measured by the voltage drop between A and B pins at the indicated current through the switch. On resistance is determined by the lower of the voltages on the two (A or B) pins.

AC Characteristics (Ta = –40~85°C)

Characteristics	Symbol	Test Condition		V_{CC} (V)	Min	Max	Unit
Propagation delay time (bus to bus)	t_{pLH} t_{pHL}	Figure 1, Figure 2	(Note 4)	4.5	—	0.32	ns
Output enable time	t_{pZL} t_{pZH}	Figure 1, Figure 3		4.5	—	4.5	ns
Output disable time	t_{pLZ} t_{pHZ}	Figure 1, Figure 3		4.5	—	5.0	ns

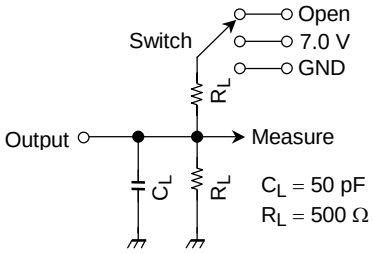
Note 4: The propagation delay time is calculated by the RC (on-resistance and load capacitance) time constant.

Capacitive Characteristics (Ta = 25°C)

Characteristics	Symbol	Test Condition		V_{CC} (V)	Typ.	Unit
Control pin input capacitance	C_{IN}		(Note 5)	5.0	3	pF
Switch terminal capacitance	$C_{I/O}$	$\overline{OE}$ = V_{CC}	(Note 5)	5.0	10	pF

Note 5: This parameter is guaranteed by design.

AC Test Circuit



Parameter	Switch
t_{pLH}, t_{pHL}	Open
t_{pLZ}, t_{pZL}	7.0 V
t_{pHZ}, t_{pZH}	Open

Figure 1

AC Waveform

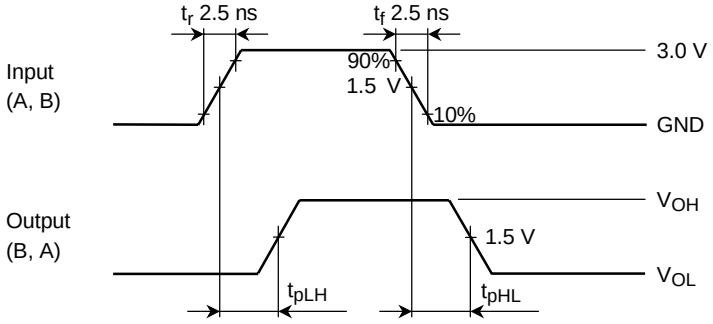


Figure 2 t_{pLH}, t_{pHL}

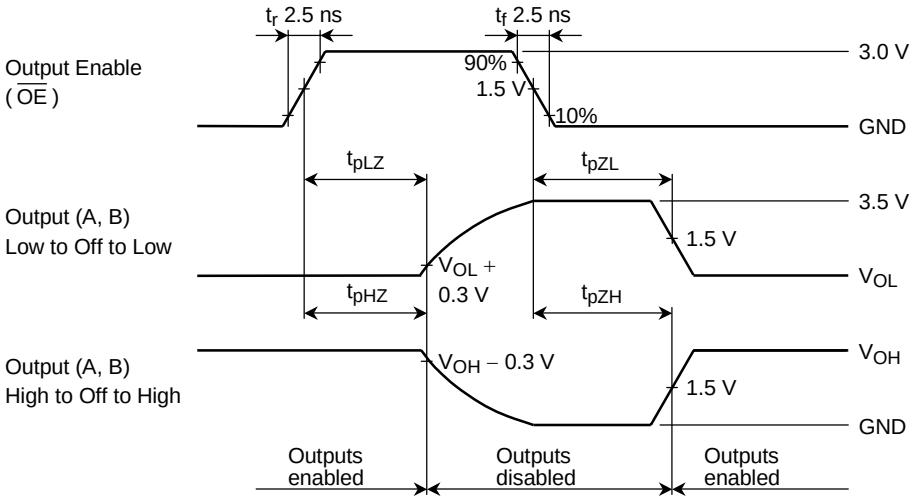
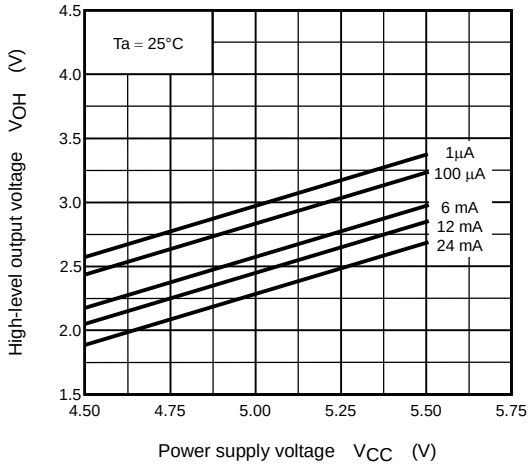
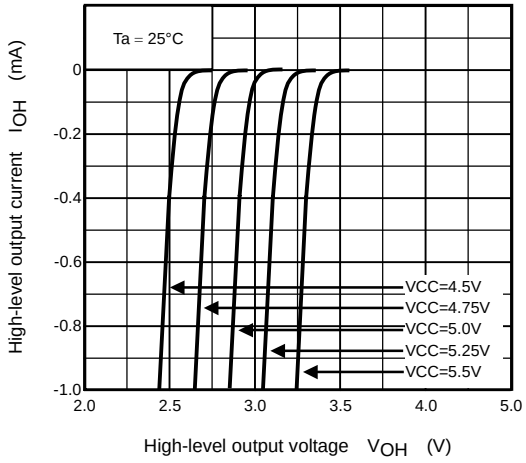
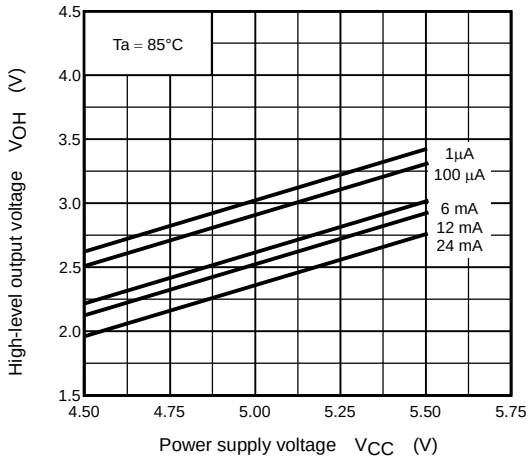


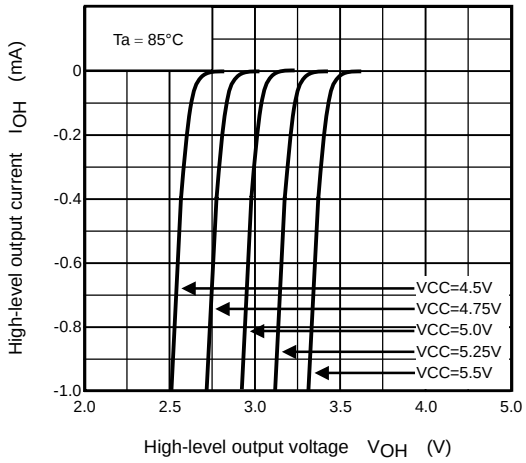
Figure 3 t_{pLZ}, t_{pHZ}, t_{pZL}, t_{pZH}

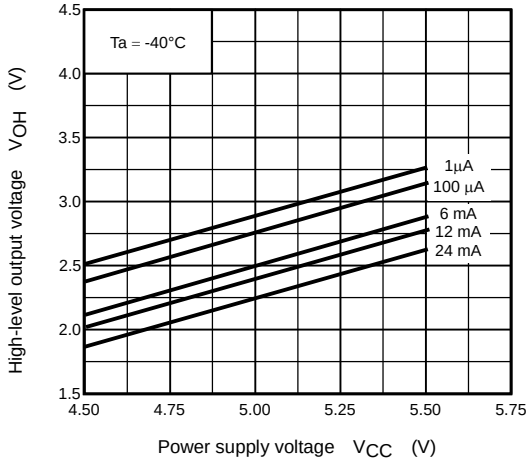
V_{OH} – V_{CC} Characteristics (typ.)











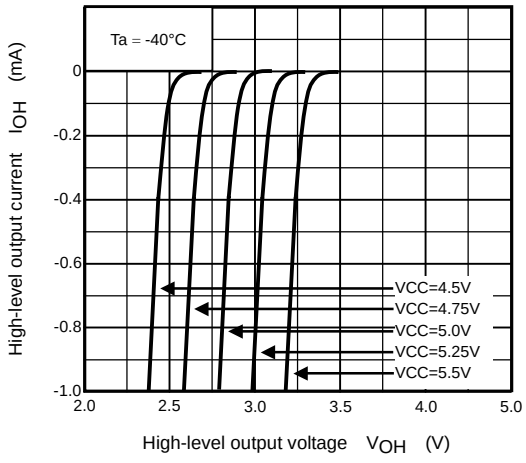
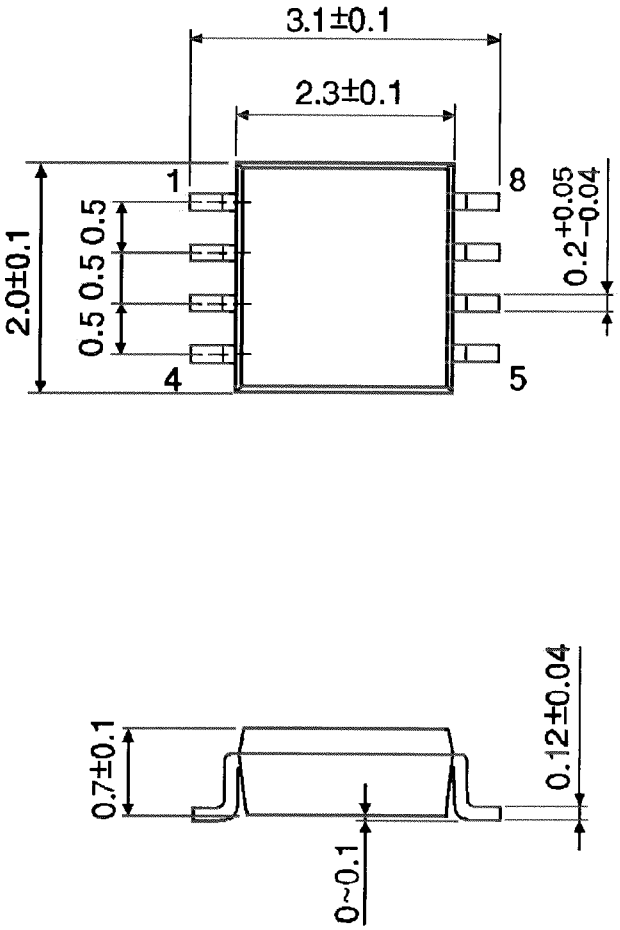


Figure 4

Package Dimensions

SSOP8-P-0.50A Unit : mm



Weight: 0.01 g (typ.)

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